NEXO

INNOVATE

NX242 Digital TDcontroller

Declaration of conformity

This equipment has been tested and found to comply with the safety objectives and essential requirements of European (73/23/EEC and 89/336/EEC directives) and international Standards, by fulfilling the requirements of the following harmonized standards:

Electrical Safety (EU) : IEC 60065 (12/2001) Audio, video and similar electronic apparatus

Electrical Safety (US) : UL60065 Seventh Edition, dated June 30, 2003 category AZSQ, E241312.

Electrical Safety (CAN) : CSA-C22.2 N°60065:03 Edition, dated April 2003 category AZSQ7, E241312

Electrical Safety (Rest of the World) : CB test certificate DK-8371 based on IEC60065-2001 7nd ed. with all national deviations.

Radiated Emission (EU) : EN55103-1 (1996) Electromagnetic compatibility - Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use.

Radiated Emission (US) : FFC part15 class B

Radiated Emission (CAN) : This Class B digital apparatus complies with Canadian ICES-003.

RF Immunity (EU) : EN55103-2 (1996) Electromagnetic compatibility - Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use.

c UL us LISTED Audio Equipment 10CE

Note: EMC conformance testing is based on the use of recommended cable types. The use of other cable types may degrade EMC performances.

IMPORTANT SAFETY INSTRUCTIONS

1) Read these instructions.
2) Keep these instructions.
3) Heed all warnings.
4) Follow all instructions.
5) Do not use this apparatus near water.
6) Clean only with dry cloth.
7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8) Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9) Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet. (US market)
10) Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11) Only use attachments/accessories specified by the manufacturer.
13) Unplug this apparatus during lightning storms or when unused for long periods of time.
14) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Information about products that generate electrical noise :

NOTE: The United States Federal Communications Commission (in 47 CFR 15.105) has specified that the following notice be brought to the attention of users of this product:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet, prepared by the Federal Communications Commission, helpful: How to identify and Resolve Radio/TV Interference Problems. This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4. Use of a shielded cable is required to comply within Class B limits of Part 15 of FCC Rules. Pursuant to Part 15.21 of the FCC Rules, any changes or modifications to this equipment not expressly approved by NEXO S.A. may cause, harmful interference and void the FCC authorization to operate this equipment.

The lightning flash with arrowhead symbol, within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

CAUTION

RISK OF ELECTRIC SHOCK DO NOT OPEN

WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

To avoid electrical shock, do not remove covers. Dangerous voltages exist inside. Refer all servicing to qualified personnel only.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING ! This appliance is a CLASS 1 apparatus and must be earthed.

The green and yellow wire of the mains cord must always be connected to an installation safety earth or ground. The earth is essential for personal safety as well as the correct operation of the system, and is internally connected to all exposed metal surfaces. Additional recommendation for interconnection to other equipment can be found in the "Setting-Up Advice" section page 8.

Déclaration de conformité

Cet équipement a été testé et répond aux objectifs de sécurité et exigences essentielles de la directive 73/23/EEC sur les basses tensions et la directive 89/336 EEC sur la compatibilité électromagnétique, notamment:

Sécurité électrique (EU) : IEC 60065 (12/2001) Appareils audio, vidéo et appareils électroniques analogues - Exigences de sécurité

Sécurité électrique (US) : UL60065 Seventh Edition, dated June 30, 2003 category AZSQ, E241312.

Sécurité électrique (CAN) : CSA-C22.2 N°60065:03 Edition, dated April 2003 category AZSQ7, E241312

Sécurité électrique (Reste du Monde) : Certificat OC DK-8371 basé sur IEC60065-2001 7eme ed. Toutes deviations

Emission rayonnée (EU) : EN55103-1 (1996) Compatibilité électromagnétique : Norme de famille de produits pour les appareils a usage professionnel audio, vidéo, audiovisuels et de commande de lumière pour spectacles Partie 1 : émissions

Emission rayonnée (US) : FFC part15 class B

Emission rayonnée (CAN) : This Class B digital apparatus complies with Canadian ICES-003.

Immunité RF (EU) : EN55103-2 (1996) Compatibilité électromagnétique : Norme de famille de produits pour les appareils a usage professionnel audio, vidéo, audiovisuels et de commande de lumière pour spectacles: Partie 2 : immunités

Note: Les tests de conformité électromagnétique ont été réalisés avec les câbles recommandés dans ce manuel. L'utilisation des même câbles est nécessaire afin de rester dans le cadre des réglementations énoncées ci dessus.

LISTED
Audio Equipment
10CE

INSTRUCTIONS DE SECURITE IMPORTANTES

1) Lisez ces instructions.
2) Gardez ces instructions.
3) Tenez compte de tous les avertissements.
4) Suivez toutes les instructions.
5) N'utilisez pas cet appareil à proximité d'eau.
6) Nettoyez uniquement avec un chiffon sec.
7) Ne bloquez aucune ouverture de ventilation. Installez conformément aux instructions du fabriquant.
8) N'installez pas à proximité d'une source de chaleur telle que radiateur, chauffage, poêle, ou autre appareil (y compris amplificateurs) qui produisent de la chaleur.
9) Ne supprimez pas le dispositif de sécurité de la prise polarisée ou de terre.
10) Protégez le cordon secteur contre les pincements ou piétinements en particulier à proximité des prises, des réceptacles adaptés, et à l'endroit ou il sort de l'appareil
11) N'utilisez que des accessoires ou fixations spécifiées par le fabriquant
13) Débranchez cet appareil pendant les orages ou lors d'une longue période sans utilisation.
14) Confiez toute la maintenance à du personnel qualifié .La maintenance est nécessaire quand l'appareil a été endommagé d'une manière quelconque, comme le cordon d'alimentation secteur endommagé, du liquide renversé ou des objets étant tombés dans l'appareil, l'appareil ayant été exposé à la pluie ou à l'humidité, ne fonctionne pas normalement, ou est tombé.

The lightning flash with arrowhead symbol, within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

To avoid electrical shock, do not remove covers.
Dangerous voltages exist inside.
Refer all servicing to qualified personnel only.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

AVERTISSEMENT! Cet appareil appartient à la CLASSE 1 et doit être mis à la terre.

Le conducteur vert et jaune du câble secteur doit toujours être connecté à la terre de sécurité d'une installation. La terre est essentielle pour la sécurité du personnel comme pour le bon fonctionnement du système. Elle est connectée à l'intérieur à toutes les surfaces métalliques exposées. Des recommandations supplémentaires pour l'interconnection avec d'autres équipements se trouvent dans la section " " Page 44.

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NX242 versus NX241: What's new ?

The NX242 Digital TDcontroller has been designed in order to provide total compatibility with its predecessor – the NX241 Digital TDcontroller.

What's remain the same?

The DSP resources for both models remain the same, so new supported set-ups (i.e. firmware loads) will be compatible with the both the NX241 and NX242 TDcontrollers. For advanced set-ups and signal processing NEXO has released the NXtension Expander Board, which has double the available DSP resources.

MENUs and functions remain the same; no learning curve is needed to go from the NX241 to the NX242.

The same LOAD and NXWIN software is used to update both TDcontrollers. The transition is transparent for the user. Note however, that the NX242 can't be flashed with LOADs prior to 2.21.

The appearance of the NX242 is identical to the NX241 except the model number. Therefore, you can mix both units in the same rack without aesthetic problems. Please note however that both NX241 and NX242 should have the same firmware revision (LOAD) to be phase compatible.

What's changed?

The overall performance of the NX242 has improved significantly: 10dB more on the dynamic range, less distortion…

The layout and ground scheme of the unit have been totally revised to cope with the most demanding situations founded in the field (low and very high frequencies). The EMC protection on every input/output and the new ground structure makes the NX242 immune to interference far beyond the recommended values founded in EMC standards. As a result, there is no need for the earth lift function found on the NX241.

The input stage is truly floating and accepts important common mode offset (resulting from very long wiring or difference of ground potential between two connected equipments) without affecting it's headroom (28dBu) and performance.

The NX242 Digital TDcontroller uses a switch mode power supply (SMPS). This SMPS accepts universal AC power input voltages in the range 90V to 264V, and requires no manual adjustment for voltages in this range.

The NX242 is designed to accept the optional NXtension board with the ES-4 EtherSound interface and the CAI interface, whereas the NX241 can only accept the CAI interface.

An external LCD contrast adjustment is now provided on the NX242.

Quick Start

This section contains a summary of the most frequently asked questions by people who haven't read the manual. You may be able to use the NX242 TDcontroller quite quickly as it has been designed to be user friendly. However **please devote some attention to reading this manual. A better understanding of specific features of the NX242 TDcontroller will help you to operate your system to its full potential.**

WARNING: Information on the amplifiers used is MANDATORY. Before using your system you MUST configure "MENU 2.6 AMP GAIN" and "MENU 2.7 AMP POWER". Failure to do so or to properly connect the Sense Lines will invalidate the NEXO warranty on the attached NEXO loudspeakers. See in " Amplifiers (Gain, Power)" page 25 the correct way to do so.

RESET

You can reset the unit without powering off by simultaneously depressing buttons A, B & "ENTER" (◂ ▸) at the same time.

Selecting cabinet family

Simultaneously depressing A & B buttons at power up or during device RESET accesses the system change menu. **Keep the A & B Buttons held until all LEDs are off.** This will allow the selection of any cabinet in any family. Using the rotary encoder, scroll through the configurations and press "ENTER" (◂ ▸) to load the required settings.

Select your cabinet set-up

In MENU 3.0 you will be able to choose among the different set-ups within the same cabinet family. (i.e. you don't have to modify the amplifier to cabinet wiring).

Navigating menus

On the controller display screen, the number before the Function corresponds to the menu number. To change the first number (this is the Main menu label) button **A** must be pressed. To change the second number (this is the Submenu label) button **B** must be pressed. To select options, turn the encoder wheel, or press the "ENTER" button (◂ ▸). Changes are immediate (no further confirmation unless clearly stated).

Back to default

In Menu 2.5 you have the possibility to put back all MENUS to the factory default (except the amplifier information that you have entered MENU 2.6 & 2.7).

Auto save

In case of power failure, the current set-up is saved two minutes after the last change made. At power up the last saved settings are restored.

Setting-Up Advice

Mains Power

WARNING ! THIS APPLIANCE MUST BE EARTHED.

The green and yellow wire of the mains cord must always be connected to an installation safety earth or ground. The earth is essential for personal safety as well as the correct installation of the system, and is internally connected to all exposed metal surfaces. Any rack framework into which this unit may be mounted is assumed to be connected to the same grounding circuit. (see also p.8)

NEXO TDcontrollers don't provide a mean to switch off the unit from the front panel. As they are intended to be rack mounted the back panel is not accessible during use. Therefore it is left to the user to provide a disconnection mean readily operable.

Voltage setting

NEXO TDcontrollers use a switch mode power supply (SMPS). This SMPS accepts universal AC power input voltages in the range 90V to 264V, and requires no manual adjustment for voltages in this range.

Mounting the TDcontroller in a rack (Grounding, shielding & safety issues)

The TDcontroller is intended for rack mounting. The only accessible part during use shall be the front panel of the TDcontroller. Any space above or under the TDcontroller shall be obstructed with a blank panel.

The rack is a free grounding and shielding structure and it provides extra shielding. Therefore, it is desirable that the screws used to fix the TDcontroller in the frame or rack provide an electrical contact between the chassis of the TDcontroller and the rack.

The primary reason for grounding is safety. Conformance to the applicable requirements of the authorities having jurisdiction is, of course, mandatory. However, grounding also has an impact on electromagnetic compatibility. From the EMC point of view, it is desirable to have a low impedance ground network, as a current flowing in the ground network will then produce low voltage in the network. A low impedance network can be obtained using a multipoint ground scheme, with as many closed ground loops as is economically possible.

Fuse

The fuse provided in the unit will not blow during normal operation. If the fuse blows the TDcontroller has malfunctioned. This fuse must only be changed by NEXO certified service personnel. In any case do not replace the fuse with a non-certified NEXO fuse, as this will invalidate the NEXO warranty.

CAUTION!

This servicing instruction is for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Recommendations for wiring the sense lines

The impedance of the sense inputs of the TDcontroller are high, so currents are low and therefore light duty cable can be used. If the TDcontroller is housed in the amplifier racks an unshielded cable may be used.

If the TDcontroller is located remotely - at the mixing position - a shielded cable is recommended, without using the shield as a conductor. The cable must be well protected from public access, as it carries potentially dangerous amplifier voltage.

When one of the channels is not being used and the corresponding sense line is disconnected, cross talk onto the inactive sense line may in some cases produce signals capable of causing the inadvertent illumination of the Sense LED on that channel; although this has no effect on the internal operation of the TDcontroller, it can be cured by short-circuiting the terminals of the inactive sense line.

Recommendations for wiring the audio outputs

The output stages can drive several amplifiers in parallel; however it is not advisable to work with loads of less than 1kOhm(and strictly forbidden to drive less than 600Ohms). It is best to check the impedance characteristics of the amplifier inputs - supplied by the manufacturer - to check how many amplifier channels can be paralleled. Where precise information is not available (and taking 10kOhm as the minimum value possible), ten channels in parallel per output is a sensible maximum.

Electromagnetic environments

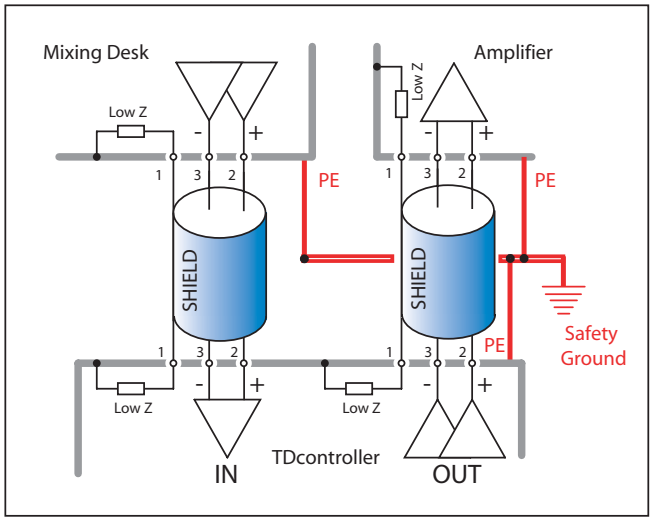
The emission (this word describes all types of electromagnetic noise radiated by the equipment) requirements which have been applied to Nexo's TDcontrollers are the stringent requirements of the "Commercial and light industrial environment" of the product family EMC standard for emission.

The immunity (this word describes the ability to cope with electromagnetic disturbance generated by other items and natural phenomena) requirements that we have considered exceed those applicable to the "Commercial and light industrial environment" of the product family EMC standard for immunity. In order to provide a further safety margin, we recommend that you do not operate the TDcontrollers in the presence of electromagnetic interference exceeding half of the limits found in this standard.

These two EMC standards are those applicable to pro-audio equipment for the implementation of the "EMC directive".

Analogue signal cables

Analogue signals should be connected to the input and output ports of the TDcontroller via shielded twisted pair or starquad cable fitted with XLR connectors on the TDcontroller side. We recommend the use of low transfer impedance cables with a braided shield and a transfer impedance below 10 mΩ/m. For the sense inputs, the noise requirements are not as stringent, and any kind of twisted pair cable will be adequate.



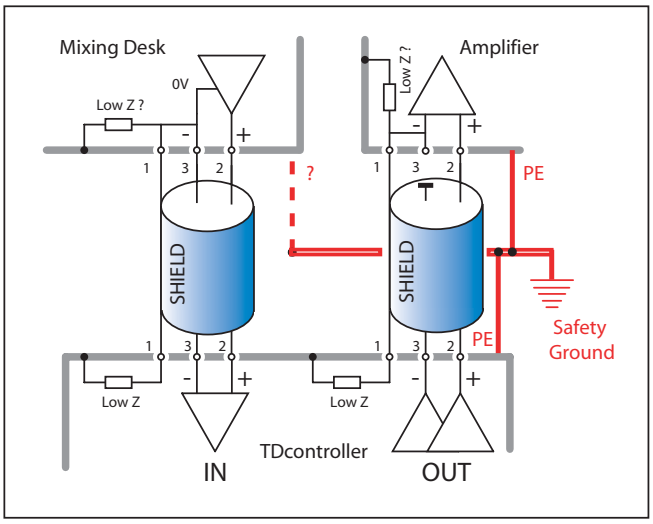
The TDcontroller is intended to be used with

symmetrical (balanced) sources (for instance a mixer) and symmetrical loads (for instance a power amplifier (see figure). You can see that the TDcontroller provides a low impedance path between pin 1 of its XLR connectors and its chassis. The TDcontroller can sustain high current in pin 1 without degradation of output noise. We recommend that the sources and loads you use have the same desirable characteristics.

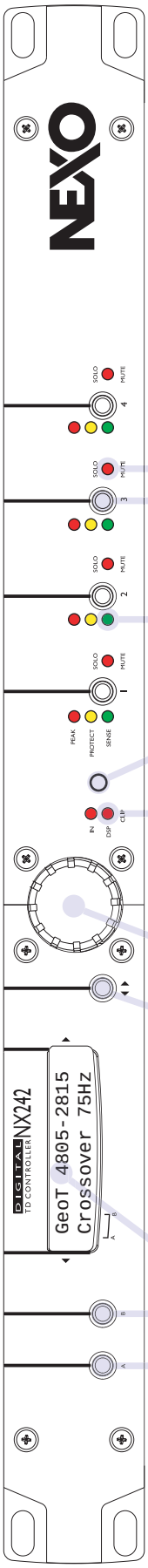
It is sometimes claimed that connecting cable shield at both ends creates ground loops, and that the current flowing in such loops will produce noise. This is not the case for most professional audio equipment. In short, there are two kinds of loops in which voltages are present: the loops formed by signal wires, and the loops formed by grounded conductors, among which are protective earth conductors (PE) and signal cable shields.

When a cable shield is grounded at both ends, a loop is closed, and the resulting current causes a reduction of the voltage induced on signal lines. This effect is what the cable shield is intended to produce, since this is how it protects your signal from magnetic fields.

If you are using an asymmetrical (unbalanced) source (not recommended), it is best to use a shielded twisted pair and to connect wire 3 of the cable to the shield at the source output end (see figure). This technique prevents noise currents flowing on the return path of the signal. If you are using an amplifier with an asymmetrical (unbalanced) input, it is best to use a shielded twisted pair, and to connect wire 3 at the TDcontroller end only, as shown in Fig. 2. This keeps a good capacitance balance for the signal, however noise currents flow on the return path of the signal. (Note that this is only acceptable for a short cable).



If you are using a symmetrical (balanced) source or amplifier which is prone to become noisy when a current of less than 100 mA at the mains frequency (50 Hz or 60 Hz) is sourced into pin 1 of its XLR connectors, you might consider opening the ground loops.



High end Floating balanced Input

Maximum Clipping input : 28dBu
Nominal Input impedance : 19.8kOhm
Common Mode Ratio (CMRR): 85dB
Very High Immunity to common mode interferences

HEADROOM adjustement allows the signal to be scaled to the Analogue to Digital Converter, keeping the unity gain of the NX242

High end AD converter :24bit allowing a 110dB Dynamic range (analogue to analogue)

Blanking panel

In this slot goes the optional NXtension-CAI and NXtension-ES4 Expander Boards.

Mute & Solo Buttons

Red LED : Muted Channel

Channel monitoring

Red LED Peak Limiting : Prevent your amplifier from overloading
Yellow LED Protections : Prevent speaker Displacement and Temperature failures
Green LED Signal : Monitor amplifier signal & displays sense error alerts.

LCD contrast adjustment

Input Overload / DSP Clip

Heavy Duty Balanced Output Stage.

High end DA 24bit convertion
Delivers up to 28dBu into 600Ohm load

Rotary Encoder

Enter Button

Serial Connection RS232 to PC

Connect your NX242 to the COM port of your PC to update the NX242 Firmware.

Sense Line Connector to amplifier

Allows the best use of the protection process, including the amplifier analysis (gain and clipping voltage). Failing to connect the sense connector may damage your speakers.

LCD screen

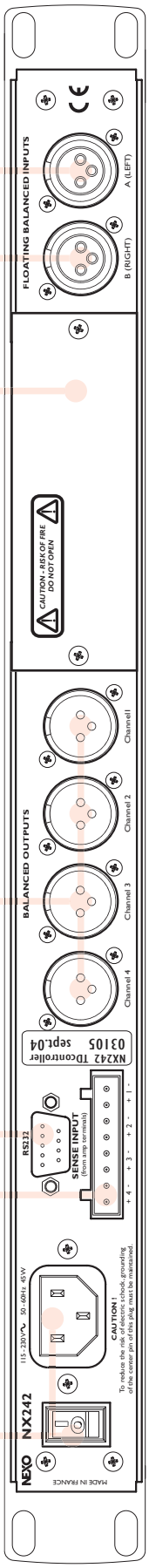
Menu Selection

Sub Menu B Selection
Main Menu A Selection

Switch mode power supply

Detachable Power cord shall comply with your country regulation.
Allows continuous operation between 90V and 260V. No Adjustment required.

ON/OFF Mains Switch



GENERAL DESCRIPTION

Global architecture

Global architecture is based upon a full 24bit audio path with 48bit core calculator running at 100 Million Instructions per Second. Featuring:

- 2 analogue inputs (floating balanced) 24bit resolution ADC.
- 4 analogue outputs (balanced) 24bit resolution DAC.
- 4 sense inputs (balanced) 16bit resolution ADC.

Set-up configurations

The audio path is automatically adjusted within the NX242 according to the setups (PS15, GEOT, CD18) chosen by the user. This will affect the delays and gain control. For instance changing the gain of a CD18 cabinet will affect two channels at a time, changing the gain on a 3 WAY cabinet (e.g. Alpha) will affect three channels, etc.

At the time of writing, the following configurations are used (for a complete description Appendix A on page 37 for the list of setups currently supported)

Channel 1	Channel 2	Channel 3	Channel 4
unused	unused	2 WAY Passive Cabinet	2 WAY Passive Cabinet
Channel 2 duplicated	Sub	2 WAY Passive Cabinet	2 WAY Passive Cabinet
Sub	Sub	2 WAY Passive Cabinet	2 WAY Passive Cabinet
1WAY Active cabinet	1WAY Active cabinet	1WAY Active cabinet	1WAY Active cabinet
unused	1WAY Active cabinet	1WAY Active cabinet	1WAY Active cabinet
Cardioid back	Cardioid front	Active cabinet	unused
Cardioid back	Cardioid front	Active cabinet	Channel 2 duplicated
Cardioid Sub 1 back	Cardioid Sub 1 front	Cardioid Sub 2 back	Cardioid Sub 2 front

You may have noticed that certain configuration (4 passive cabinets for instance) are not supported. Using those configurations requires the addition of the optional NXtension Expander Board. Please refer to the separate manual for additional information.

Block diagram description

Equalisation & Filtering

The number between parenthesis refers to the number circled in the block diagram.

Subsonic and VHF filtering (1)

Low and high-pass filters are used to filter out frequency components that could possibly degrade the performance of the TDcontroller and amplifiers. The filters are optimised to work in conjunction with overall system response.

The high pass filters are also extremely important as they optimise excursion at very low frequency which is a very important safety factor. (Therefore do not use set-ups which are not designed for the cabinet you are using).

Equalising wideband acoustical response (2)

This wideband equaliser section achieves the correction required to obtain a flat system response, as the cabinets are acoustically designed for maximum efficiency on the whole frequency range. Active rather than passive attenuation allows the lowering of amplifier voltages for a given output SPL and therefore increases the maximum SPL achievable with the same amplifier.
Active equalisation also extends system bandpass especially at low frequencies where acoustical performance is limited by cabinet size.

Equalising single component response (3)

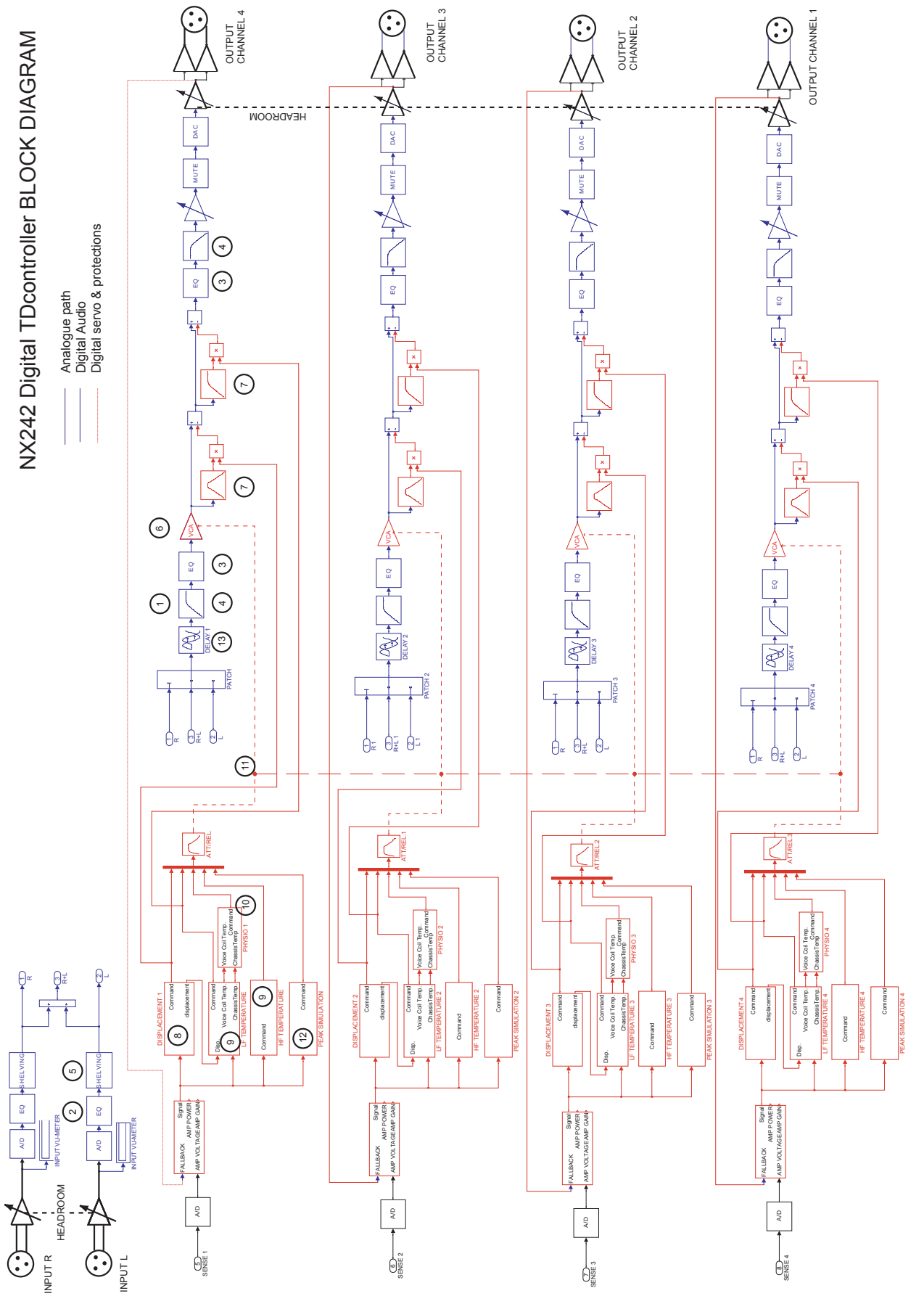
This equaliser set allows acting on a specific driver after the crossover, rather than the on wideband section. This allows to EQ one driver without affecting the others (cleaning out of band response, fine tuning in a crossover…). All the parameters are factory set.

Crossover section (4)

Crossover between different bands is tuned for every set-up of every cabinet. Each crossover is customized so that each transducer will fit with its neighbour by achieving a perfect phase alignment. Unconventional, crossover-defined filters are applied, ranging from 6dB/octave to near infinite slopes according to the type of crossover desired. Time alignment is also unconventionally achieved, by combining crossover filter group delays with allpass and/or frequency dependent delays.

User set-up, Array EQ (5)

A basic Array EQ is currently implemented in the NX242. The cut off frequency of a low-shelving filter is factory tuned for each cabinet set-up. The user has access to the gain of this filter. The array EQ is tuned in order to reproduce the effect of the bass coupling, allowing the user to increase or diminish the effect of the stacking.


NX242 Digital TDcontroller BLOCK DIAGRAM
Analogue path
Digital Audio
Digital servo & protections
OUTPUT CHANNEL 4
OUTPUT CHANNEL 3
OUTPUT CHANNEL 2
OUTPUT CHANNEL 1
HEADROOM
INPUT R
INPUT L
INPUT VU-METER
A/D
EQ
SHELVING
DAC
MUTE
VCA
DELAY 1
DELAY 2
DELAY 3
DELAY 4
PATCH
PATCH 2
PATCH 3
PATCH 4
ATT/REL
ATT/REL 1
ATT/REL 2
ATT/REL 3
DISPLACEMENT 1
DISPLACEMENT 2
DISPLACEMENT 3
DISPLACEMENT 4
PHYSIO 1
PHYSIO 2
PHYSIO 3
PHYSIO 4
LF TEMPERATURE
HF TEMPERATURE
LF TEMPERATURE 2
HF TEMPERATURE 2
LF TEMPERATURE 3
HF TEMPERATURE 3
LF TEMPERATURE 4
HF TEMPERATURE 4
PEAK SIMULATION
PEAK SIMULATION 2
PEAK SIMULATION 3
PEAK SIMULATION 4
FALLBACK
AMP POWER
AMP VOLTAGE/AMP GAIN
SENSE 1
SENSE 2
SENSE 3
SENSE 4

Protection

VCAs (6) and VCEQs (7)

Each channel has its own simulation and protection process.

Each audio channel contains a combination of controlled gain stages (let's call them VCA's as in our analogue circuitry). These VCA's are embedded into complex composite structures in order to change their basic operation into frequency selective attenuation. This operation is similar to that of a voltage controlled dynamic equaliser (VCEQ).

Each VCEQ and VCA is controlled by the synthesis of several signals issued from the various detection sections. That synthesis is in fact the envelope of those signals, with an optimised release and attack time for each VCEQ and VCA (depending on its frequency range and the cabinet selected).

Displacement control (8)

The sense input signal is sent to a shaping filter producing a signal whose instantaneous amplitude is proportional to the voice coil excursion. This signal, after rectification, is compared to a preset threshold matching the maximum usable value, as determined from laboratory measurements. Any part of the signal exceeding the threshold is sent to the VCEQ control buffer while the VCEQ acts as an instantaneous limiter (very short attack time) to prevent displacement from overriding the maximum permissible value.

Temperature control (9)

Each sense signal is fed into a shaping filter (one per transducer), each one producing a signal proportional to the instantaneous current flowing into the voice coil of the transducer. After rectification, this signal is integrated with attack and release time constants equivalent to the thermal time constants of the voice coil and chassis, producing a voltage, which is representative of the instantaneous temperature of the voice coil.

When this voltage reaches the threshold value corresponding to the maximum safe operation temperature, the VCA becomes active to reduce the Audio signal level and limit the effective temperature to fall under the maximum usable value.

In order to avoid detrimental effects induced by very long release time constants coming from the temperature detection signal (level being reduced for an extended period, « pumping » effects...), the detection signal is modulated by another voltage integrated with faster time constants matching the sound level subjective perception. This allows the controller to reduce the effective operation duration of the temperature limiter and make it sound more natural, while the efficiency of protection is fully preserved and operation thresholds are unaffected (kept as high as possible).

Physiologic Dynamic Control (10)

The so-called Physiologic Dynamic Control is intended to avoid unwanted effects as a result of a too long attack time constant. By anticipating the operation of the temperature limiter, it prevents a high level Audio signal appearing suddenly then being kept up for a period, which is long enough to trigger the temperature limiter. Without this, a rough and delayed gain variation would result which would be quite noticeable and unnatural.

The Physio control voltage acts independently on the VCA with its operation threshold slightly lower (3 dB) that of the temperature limiter and a low compression ratio; its optimised attack time constant allows it to start operating without any subjectively unpleasant transient effects.

Interchannel regulation (11)

As described before, each transducer is individually servo-controlled for temperature.

This means in practice that, in case of a potential risk detected, protective operation would only affect the concerned driver. Your driver will be protected but the overall system tonal balance could be altered if the different channels are not heating at the same time. In addition, triggering a temperature protection means that the loudspeaker has already lost some efficiency (power compression up to 3dB in extreme cases)

The purpose of interchannel regulation is to cancel that effect by linking VCAs together. When the protection is activated on one channel and reaches a predetermined threshold, the regulation section begins to correct the balance between the different channels (HF, MF, and LF) by acting on the concerned VCA.

Peak limiter (12)

The peak limiter primary function is to avoid massive clipping of the amp, which can have some very audible artefacts.

The threshold of the peak limiter is determined by the user to match its amplifier. See in " Amplifiers (Gain, Power)" page 25.

The second function of the peak limiter is to avoid huge amounts of power being sent to a driver. Each driver is protected in temperature and displacement but there could be other factors of destruction that cannot be predicted by simulation (especially mechanical damage to the cone…). Each driver is specified for a certain power handling and a factory set peak limiter threshold is tuned to avoid any abuse.

Delay & polarity inversion (13)

Input to output delay without filtering is 2.2ms (due to the digital processing). The latency time of the NX241 used to be 1.4ms. Since the LOAD2_21 the latency time of the NX241 has been artificially extended to 2.2ms to achieve phase compatibility with the NX242 (and so the delay between the 2 units is less than a sample). For that reason: **Do not mix NX241 with a LOAD earlier to 2.20 with the NX242**

This delay will prevent also compatibility with analogue TDcontrollers. **ANALOGUE AND DIGITAL TDCONTROLLER SHOULD NOT BE MIXED IN THE SAME SYSTEM.**

Factory set-up delay

Note that each output may contain a small phase adjustment delay at the crossover point. Also, a polarity inversion may be performed. These adjustments are part of the factory set-ups and are necessary to time-align the corresponding cabinet that is selected.

User set-up delay

Following user delay adjustment is possible:

GLOBAL: Affecting all channels at the same time (delaying all the system for application as delay towers…)

MAIN: Affecting only the channels driving the MAIN system (differ in case of TWO cabinet or 3WAY cabinet)

SUB: Affecting only the channels driving the SUB system.

GLOBAL and MAIN/SUB delays are cumulative up to 150m per channel (about 450ms, 500 feet).

Audio Input/Output

See also the wiring recommendations in the “setting up advices” section, at the beginning of this manual.

Floating balanced audio input

A new ruggedized, truly floating, high-end performance Input stage has been developed for the NX242. In the max HEADROOM position, it is accepting input level up to 28dBu and keeping this performance when driven by unbalanced impedance sources or when submitted to high common mode level.

The analogue inputs are on 3 pin female XLR connectors with positive and negative signal polarities on pins 2 and 3 respectively. Pin 1 is directly coupled to the chassis.

The input signal can be adjusted in MENU 1.1 HEADROOM in order to avoid clipping of the A/D converter. See corresponding paragraph (MENU section page 19)

Balanced audio output

The analogue outputs are on 3-pin male XLR connectors with positive and negative signal polarities on pins 2 and 3 respectively. Pin 1 is directly coupled to the chassis. The output will deliver a full-scale output of +28dBu(balanced 600 / 1nF load.)

During A/C power up of the NX242, all outputs are muted by firmware-controlled relays (strapping pin 2 and pin 3 of each output).

General functions

Remote sense lines

Line input (–18dB less than the amplifier gain) is allowing remote sensing. You will need to use this function to have an 18dB gain attenuator near the amplifier. This function enables you to keep the TDcontroller at the mixing position and still being able to feed an attenuated amplifier voltage (for safety reasons) to the sense line connector.

Reset

Holding down the three menu buttons (A, B, ◂ ▸) simultaneously will reset the unit. Reset has the same effect as powering on and off the unit. The unit will mute (hardware) for 5 seconds with all LED's on. The unit will then return to the last set-up automatically saved (every 2 minutes).

Resetting the unit from the front panel is needed to change the cabinet family (Press the three buttons to reset then let go of the ENTER button to enter into MENU 0). In that case you will have to keep the A & B Buttons until all LEDs light off.

Mute/Solo buttons

Front panel, direct access. The Mute (or Solo) mode is selected in the user menu. Please note that these MUTEs are soft mute and are therefore not operating output relays.

Display & Indicators

User control of all settings is via two menu scroll pushbuttons, an additional assignable pushbutton, an assignable rotary encoder and a backlit 16*2 character display.

Three LED's per channel for sense (green), peak limit (red) protects (yellow). Four dedicated LED's are situated alongside the associated MUTE/SOLO button.

Two LED's to indicate input overload and signal clipping into the DSP.

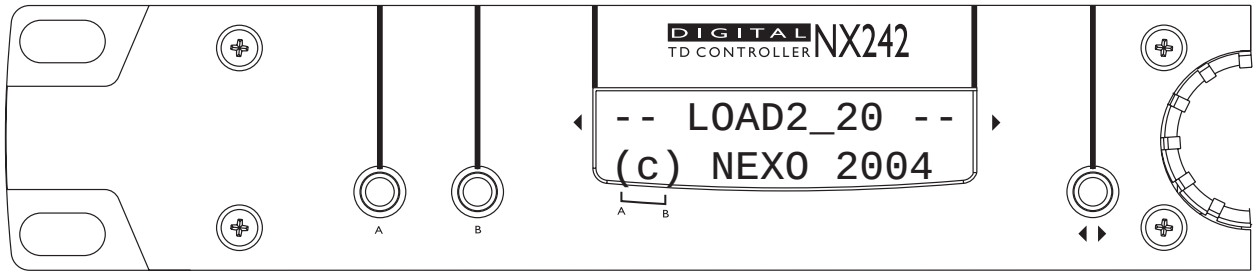
Default screen will pop up after 2 minutes and display the current set-up.

Contrast adjustment

A hole in the front panel allows the adjustment of the contrast of the LCD screen.

Serial link / Downloader

The unit can be RS232 linked to any PC in order to download new versions of Firmware using a Windows compatible Downloader program. See corresponding chapter page 32.



MENU DESCRIPTION

On the controller display screen, the number before the Function corresponds to the Menu Number. To change the first number (this is the Main menu label) button A must be pressed. To change the second number (this is the Submenu label) button B must be pressed. To select options, turn the encoder wheel, or press the ENTER button (◂ ▸). Changes are immediate (no validation is required unless clearly stated).

Please refer to the release notes issued with each new download to track eventual menu changes.

Main Family Selection

Changing Cabinet Family

In order to prevent end-user changing between different NEXO system set-ups during use, the following procedure is obligatory. This procedure has been purposely designed to avoid any mistake. It is nevertheless very easy to change set-up among the same family (see menu 3)

Depressing A & B buttons while the NX242 is resetting. You can reset the unit without powering off by simultaneously depressing buttons A, B & ENTER (◂ ▸) at the same time.

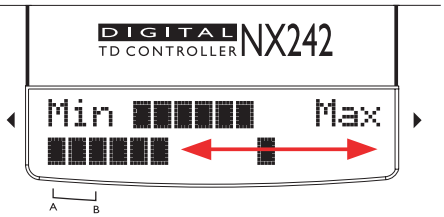
Note: Selecting a new family will set all parameters to factory default settings.

User settings

1.1 HEADROOM

Allows the user to adjust the headroom (8 steps, 3dB each) before the A/D converter without changing the overall gain of the processor. Factory default is set to maximum headroom (and so, maximum noise). This can be adjusted if you feel the processor is too noisy for lower level applications.

An Input bar graph meter displays input level and headroom before input clip. The maximum of the left and right input is shown on the meter. Note that the meter does not show DSP clipping.



The input meter is accessed through the MENU 1.1 (HEADROOM) by depressing ENTER ◀▶ button. Press the ENTER ◀▶ button to toggle between the meter and the normal HEADROOM screen. Note: In meter mode, the default screen is not activated.

The meter also pops up automatically when the signal is above a certain threshold.

The red arrow above illustrates the Headroom available before clipping of the input converters of the NX242. The dynamic range of the meter is 24 dB. The scale is given below; maximum being 0dBFS (the red LED marked 'in clip' will light).

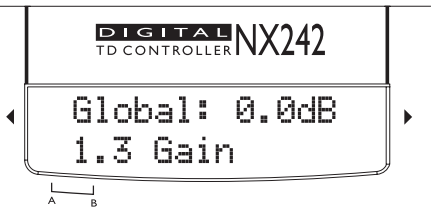
A permanent peak hold allows you to see if input clipping has reached. Changing the headroom (by turning the wheel) resets the peak hold indication. You can also reset the peak hold (without changing the headroom) by pressing the enter ◀▶ button twice.

To set the HEADROOM correctly, feed a typical example of the loudest desired program level into the NX242. Reduce the Headroom by turning the wheel anti-clockwise until the INPUT LED or DSP LED indicates the NX242 has reached clipping. Then go one click backwards (turn the wheel clockwise). The signal should now be clearly visible on the meter scale, but without reaching the right-hand end of the display.

1.2 DELAYS [Sub / Main / Global]

Each output channel can be delayed by up to a maximum (global + individual delay) of 450ms (150m). See page 17

The unit can display in [FEET / METRES / SECONDS] as required. Delay is adjustable in 10cm (0.3ms) increments. The control pot will accelerate through the adjustments faster according to the speed of use.



1.3 OUT Levels

[Global / HF /MF / LF / SUB]]

Adjust overall & separate TDcontroller gain with this menu.

These gain controls are provided to adjust the tonal balance of the system by acting on separate channels. You can also compensate for gain differences between different amplifiers. (Although the use of differing gain structure amplifiers in the same set-up is possible it is not recommended).

Each of the individual or global gain is +/- 6dB. (Step

0.5dB)

1.4 Mute/Solo

Allows the user to switch the function of the front panel channel buttons between Mute and solo mode.

Individual channel muting is made in the DSP processor itself. However, when all 4 MUTE buttons are active the output relays bypass the circuitry, to eliminate any residual noise.

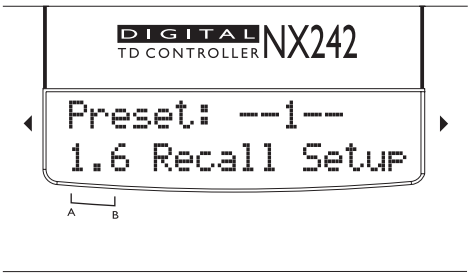
1.5 SAVE Set-up

It is possible to store and recall up to 10 user set-ups but **excluding MUTE BUTTONS STATE**.

Additionally the current set-up is saved in case of power failure every two minutes after the last change. At power up this set-up is restored.

Set-ups are numbered from 1 to 10. When saving your set-up you can choose a reference name up to 6 characters for identification purposes.

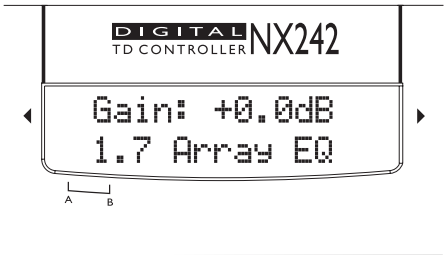
NOTE: ALL SAVED SETUPS WILL BE ERASED WHEN DOWNLOADING A NEW VERSION OF THE SOFTWARE.



1.6 RECALL Set-up

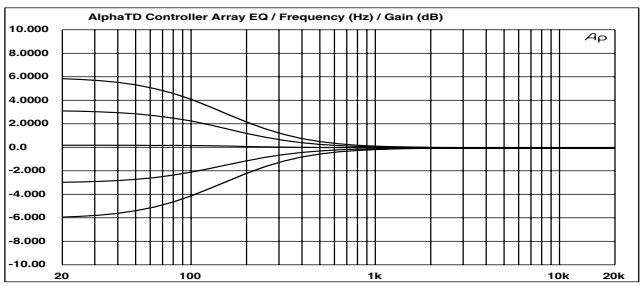
Recalling a user set-up is forbidden if the family of cabinet is not the same.

When recalling a set-up, the unit will stay in the recall menu allowing another selection for comparison. Switching from a set-up to another is glitch-free and instantaneous (no muting takes place).



1.7 Array EQ

One array EQ gain control of +/- 6dB (0.5dB step) is included. This filter frequency is factory tuned.



System settings

2.1 Revision [soft & hard rev]

Displays the revision number of the LOAD; DSP SOFTWARE; FLASH BOOT; HARDWARE and SERIAL NUMBER. Turn the encoder to access to the different revision screens.

Check on our web site www.nexo.fr if your unit is updated.

2.2 Security [password]

The user password facility allows switching between "free access", "unit locked" and "Change password. The factory default password is NEXO.

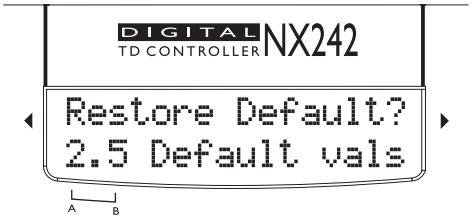
This allows you also to get into an INSTALLER menu. Please contact your NEXO dealer if access required.

2.3 Reserved

This menu was formally used in the NX241 to control the EARTH LIFT. This function is not available anymore in the NX242 (due to a change in our “ground plane” politic). To keep the coherence of the MENUs between NX241 & NX242 we have nevertheless keep this slot unused.

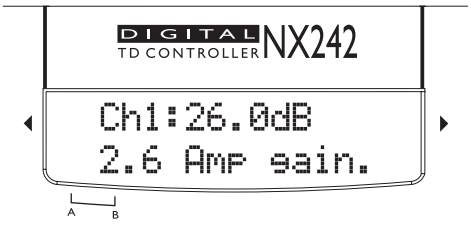
2.4 SENSE GAIN

Allows switching between line level sense lines and amplifier level sense lines. (0 or 18dB gain on the sense line)



2.5 Restore Default

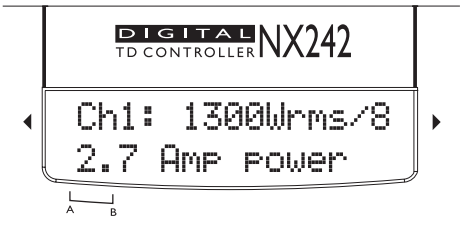
Restores the factory defaults. System related values like the AMP GAIN and AMP Power will not change.



2.6 AMP GAIN

Adjustable from 20dB to 40dB nominal Amp Gain in 0.5dB steps for each channel.

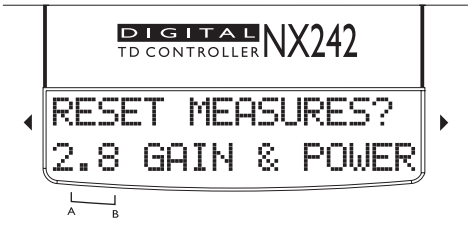
See in " Amplifiers (Gain, Power)" page 25 a complete description of this menu, and the way to adjust this setting.



2.7 AMP POWER

Allows you to enter a Nominal Amp RMS power into 8ohms. Adjustable from 200 Watts to 5000 Watts in 50W steps for each channel.

See in " Amplifiers (Gain, Power)" page 25 a complete description of this menu, and the way to adjust this setting.



2.8 Reset measure & Sense Alert

The first section of Menu 2.8 allows you to reset the gain and power reading to default settings. If the ENTER ◀▶button is pressed, the values are reset, and menu 2.6 is displayed again. Use this feature if any physical changes have occurred in your system to start again the measurement process.

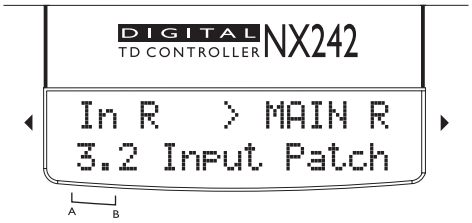
Turn the encoder wheel to reach the second section of Menu 2.8, which is the alert disable menu. Press the enter ◀▶ button to set the alerts (Led flashing) on or off. Once disabled, the LEDs will not flash if gain settings are incorrect. This parameter is saved every time the NX242 returns to the default screen, or when a setup is saved in the menu 1.5.

Configuration select.

3.1 System Config.

Changing a set of parameters within the same family is made immediately and is barely audible.

Input Patch, MENU3.2



Each output (or group of outputs when a system uses more than one output per cabinet – like the Alpha M3 or CD12/CD18 subs) may be configured to receive either LEFT, RIGHT or (LEFT+RIGHT) inputs. The Left and Right mode sums the two inputs together, but attenuates the level by 6dB to compensate.

It is thus possible to drive the main system from the LEFT input while the sub is driven by the RIGHT input and fed to the AUX of the mixing desk. However some precautions must be taken while splitting the system between MAIN and AUX outputs of the mixing desk. See the application note at the end of this manual.

Amplifiers (Gain, Power)

Power

NEXO recommends high power amplifiers in all cases. Budget constraints are the only reason to select lower power amplifiers. If an incident occurs on an installation without protection the fact that amps only generating half their rated output power (-3dB) are used will not change anything in respect of possible damage. This is due to the fact that the RMS power handling of the weakest component in the system is always 6 to 10 dB lower than the amps' ratings.

Current rating

It is very important that the amplifier behaves correctly under low load conditions. A speaker system is reactive by nature, on transient signals like music it will require much higher instantaneous current than its nominal impedance would indicate (four to ten times more). Amplifiers are always specified by continuous RMS power into resistive loads (which is irrelevant); the only useful information in that respect is the specification into a 2 ohms load. It is possible to make an amplifier listening test by loading them with twice the number of cabinets considered for the application (2 speakers per channel instead of one, 4 instead of 2…) and modulating at high level (onset of clipping). If the signal does not noticeably deteriorate the amplifier is well adapted (overheating after approximately ten minutes is normal but thermal protection must not operate too quickly after starting this test).

Amplifier gains

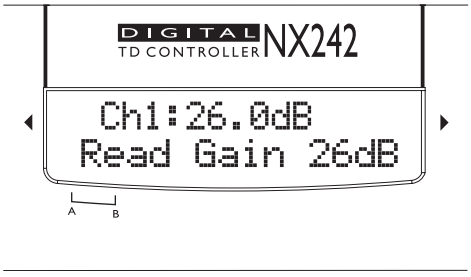
As you already read in the Quick Start section Information on the amplifiers used is MANDATORY. This value is the key of a correct protection setting. It is very important to know the gain and power of all amplifiers present in your set-up. The NX242 Digital TDcontroller provides tools to help you in this task (although the process in not totally automated for safety reason).

Some amplifier brands have an identical input sensitivity for models of different power rating (this means DIFFERENT GAIN for each model). This problematic practice, inherited from non-professional applications, is easily detected when the manufacturer specifies the same input sensitivity for all its range (like 775mV/0dBm or 1.55V/+6dBm). This translates to very high gain values on higher power models. Other brands do offer constant gain but only within a given product range (like higher gain on all semi-professional amps). Even if a manufacturer is conscious of this problem and applies the constant gain rule to all its models, the value he chooses is not necessarily the same as other manufacturers.

How to set correct GAIN and POWER information in the NX242

Menu 2.6 Amp Gain

The first line of the display shows the value entered by the user (hereafter referred to as “user gain”, while the second line displays the value read by the NX242 directly from the sense lines (hereafter referred to as “read gain”. The enter ◀▶ button allows the user to swap between channels.



The NX242 will display the following messages:

Displayed Message…	Means…
`Read gain: 26.0dB`	The last measured gain value.
`No Reading yet..`	The average of the output signal is too low (< 28dBV) to compute the amp gain.

You will also be warned of any setup problems with LED alerts (see MENU 2.8).

This read gain value is intended to help you to check the actual measured gain of your amplifier. The user gain and the read gain should be the same.

IMPORTANT: Bear in mind that any changes made in the MENU are only saved when the NX242 returns to its default screen showing the current cabinet family, or when a setup is saved in MENU 1.5 (gain & power settings are common to all presets). Do not turn off your NX242 before saving the amplifier settings.

NB:

Even when not in use, do not leave sense inputs floating; connect them to an amplifier output or short circuit the sense input to avoid cross-talk or interference in the sense circuitry. Otherwise, false error messages could result.

The gain value is not modified even if the amplifier has reached its clip point. In the case of continuous clipping of the amplifier output, the NX242 will display the wrong gain value of (because the amplifier is no longer working linearly anymore). Some amplifiers reduce their output gain when overloaded. This may be seen on the NX242's computed gain.

If the Input LED or the DSP LED are lit, the computed value of the gain may be false. Please increase the Headroom value in Menu 1.1 .

IMPORTANT: NEVER insert digital equipment or any kind of signal processing (delay lines, digital EQ, amplifier DSP modules…) between the output of the NX242 and the input of the loudspeaker cabinet. This is because any alteration to the signals may interfere with the sensing & protection algorithms.

Menu 2.7 Amp Power

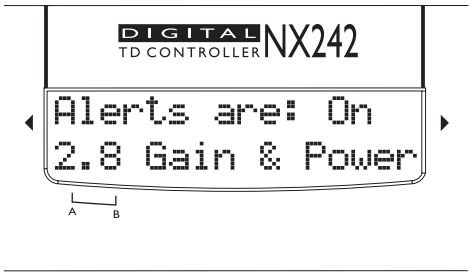
This menu will help you to enter the amplifier power value into your NX242. This power value will be used to determine the threshold of the peak limiters.

The first line of the menu displays the amp power entered by the user in the NX242. The second line displays the value the NX242 has found by scanning the highest peak value reached during amplifier clipping.

To properly set the user amp power value, please follow the following steps:

1. Unplug all loudspeaker cabinets in the system.
2. Set the NX242 on the [4 S2 cabinets S2-80 Hz] setup.
3. Ensure that the amp volume controls are set to maximum (i.e. no attenuation).
4. Ensure that the menu 2.7 user value is put to 5000W (so the peak limiting will not interfere with the measurement)
5. Feed Pink noise into the system until the amplifier is consistently clipping.
6. Read the value from the display and enter it in the user value.

The Amp power reading is a real time process and will also display a measurement while operating the system on real conditions. However the result may slightly vary according to the setup, the frequency of clipping, interactions with protections.



Menu 2.8 Sense Alerts & reset

In addition to the Amp Gain display in MENU 2.6 LED visual alerts will be triggered if user gain and read gain are not the same. Note that there are no visual alerts on the POWER computations in MENU 2.7 “Amp power”.

Flashing Mode…	Means…
	The measured gain value is under user gain (and thus the system is over-protected)
	The measured gain value is above the user gain (and thus the system is under-protected)

Small differences are allowed, i.e. there will be no alert if the measured gain is more or less than 1 dB of what the user has entered.

The first section of Menu 2.8 allows you to reset the gain and power reading to default settings. If the enter ◀▶button is pressed, the values are reset, and menu 2.6 is displayed again. Use this feature if any physical changes have occurred in your system to start again the measurement process.

Turn the encoder wheel to reach the second section of Menu 2.8, which is the alert disable menu. Press the enter ◀▶ button to set the alerts (Led flashing) on or off. Once disabled, the LEDs will not flash if gain settings are incorrect. This parameter is saved every time the NX242 returns to the default screen, or when a setup is saved in the menu 1.5.

Gain value

NEXO recommends low gain amplifiers: +26dB is recommended, as it is at the same time adequately low and quite common. This considerably improves signal to noise ratio and allows all preceding electronic gear, including the TDcontroller, to operate at optimum level. Remember that using a high gain amplifier will proportionally raise the noise floor level by the same amount.

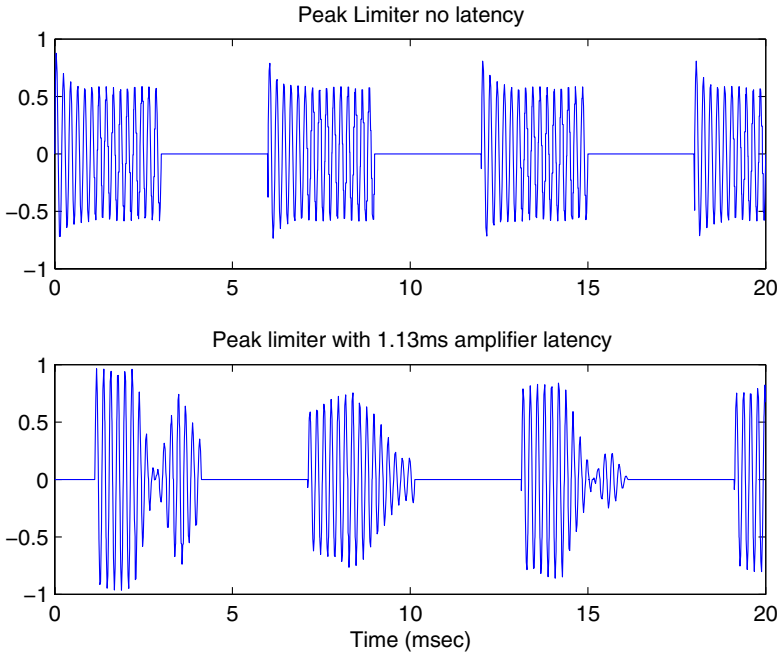
Advanced protections

Some high-end amplifiers may have some advanced functions like those found in the NX242 TDcontroller ("loudspeaker offset integration", "limiter", "compressor"...). These functions are not well adapted to specific system requirements and may interfere with existing protection within the TDcontroller. NEXO do not recommend using these functions with the NX242 TDcontroller.

Amplifier Latency effects on protection

In order to provide advanced functions (not always relevant for NEXO equipment) some amplifiers use a digital preamp section where the analogue signal provided at the input of the amplifier is converted to Digital, treated then converted back to analogue before being send to the power stage.

Such amps are delaying the signal from the value of the conversion latency. (This value reach 1.13ms on the CROWN ITECH for instance). When you put such a delay between the NX242 TDcontroller and the cabinet it has a strong effect on the protection by delaying the effect from the cause…



Lets take for example a peak limiter limiting a 5kHz signal of amplitude 1 with attack and release set to 2ms. You can easily notice that on the second axis the effect of delaying the protection has massive effects (in fact the protection doesn't work anymore). The higher the frequency, the higher the effect.

All protections dealing with displacement or acceleration of HF drivers and generally speaking all peak limiter action above 1kHz will be spoiled.

AS A RESULT NEXO STRONGLY RECOMMENDE NOT TO USE AMPS THAT INVOLVE A/D D/A CONVERSION PROCESS. IT COULD DAMAGE YOUR SPEAKER AND DEGRADE SOUND QUALITY.

Installation Recommendations

Audio Chain Recommendations

About « Loudspeaker Management Devices »

The NX242's factory delay presets are optimised to provide the best possible crossover between the MAIN SYSTEM and SUB systems.

Optimum results are always obtained for strictly identical signals feeding simultaneously all the NEXO NX242 controllers.

Typically, this signal is delivered by the stereo bus output of a parametric/graphic stereo equalizer, which is fed by the stereo output of the mixing console.

Inserting devices such as "loudspeaker management controllers" that modify the phase relationship between SUB's NX242 and MAIN SYSTEM's NX242 inputs will lead to unpredictable results, and will severely damage the final result. NEXO strongly recommends avoiding use of such devices.

Operating SUB's fed through an Aux Output

If the SUB's are to be operated through a different output than the main system, **NEXO strongly recommends that**:

- the audio chain is strictly identical for SUB's and GeoT mixing board outputs (same devices with same settings);
- phase relation between the two feeds is aligned with proper measurement tools (SMAART™, Spectralab™, MLSSA™, see below).

See also the application note page 35.

Operation of Multiple TDcontrollers

Typically, MAIN SYSTEM/SUB systems require a minimum of two NX242's per side (one NX242 for MAIN SYSTEM's, another for the SUB's). Eventually, two or more NX242's will operate within the same MAIN SYSTEM cluster. It is mandatory to verify the consistency of the setups and adjustment between processors to avoid the problems described below.

When using multiple NX242's in a single array, all parameters should be identical and set to proper values.

System alignment

For a given measurement microphone or listening position, the reference point for this adjustment is the closest point of each array (SUB and Main System) to the given position (see example below)

We recommend that the system is adjusted so that arrivals from MAIN SYSTEM array and SUB speakers are coincident at a fairly distant listening position (typically further than the mixing position).

Geometrical alignment

In the example below, r_1 being the smaller distance from MAIN SYSTEM array to listener position, and r_2 being the smaller distance from SUB to listener position, the distance difference is then $r_1 – r_2$ (specified meters or feet).

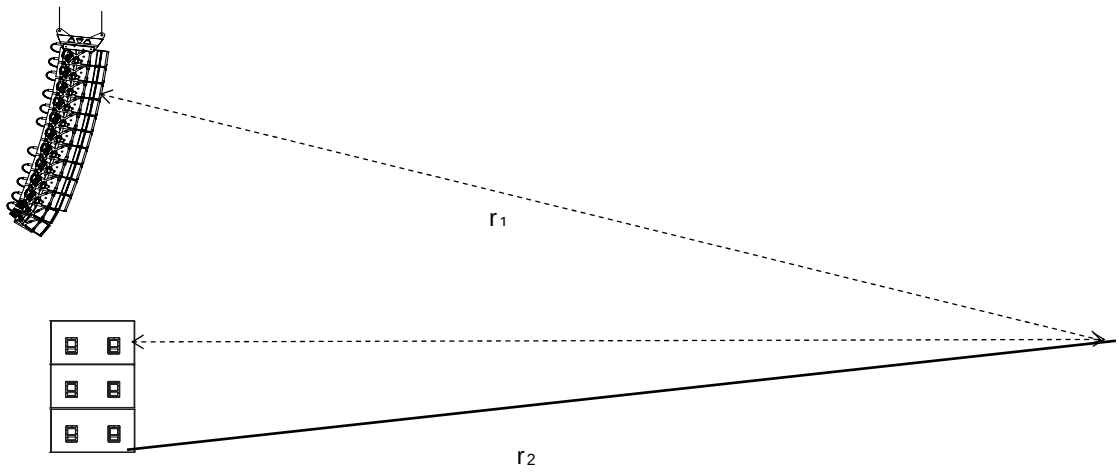
$r_1 > r_2$, the delay should be set on the SUB **NX242** TDcontroller(s).

$r_1 < r_2$, the delay should be set on the MAIN SYSTEM **NX242** TDcontroller(s)

To convert the result in time delay (specified in seconds), apply:

$t = (r_1 - r_2)/C$ r_1 and r_2 in meters, C (sound speed) 343 m/S.

The delay parameter is set in MENU 1.2 (set the units to meters, feet or seconds according to your preference).



However, it is a safe practice to double-check geometrical alignment with a proper acoustical measurement tool.

Measuring and aligning phase in the overlapping region

Microphone must be set on the ground, at a fairly distant listening position (typically further than the mixing position).

Phase must be measured with a wrapped display, and measurement must be properly windowed on signal arriving time (same window for SUB and MAIN SYSTEM). When measurement is synchronized to the system-microphone distance, phase can be clearly displayed in the low-frequency range.

If the MAIN SYSTEM phase reading appears to be superior to the SUB phase reading, then MAIN SYSTEM will have to be delayed with a value close to the one given by the geometrical alignment.

If SUB appears to be in advance to MAIN SYSTEM, then SUB will have to be delayed with a value close to the one given by the geometrical alignment.

Phase alignment can be considered as correct when phase is coincident over the entire overlapping range (typically an 1 octave from 60 Hz to 120 Hz), and when the overall response is always superior to SUB's and MAIN SYSTEM's individual response.

NEXO Windows Loader

This manual provides general downloading instructions ONLY. Please read the specific instructions (readme.txt) that come with each new LOAD file. The NEXO download software is win32 compatible and has been tested on the Microsoft Windows 95, 98, 2000 and XP

The use of any COM port is supported. The use of USB/COM adapter will depend from an adapter to the other.

The NXWIN Loader software is NX241 & NX242 compliant and only one DLD file is issued for the two TDcontroller.

Warning

The latest version of the downloader program (NXwin.exe) provided with each set of upgrade files must ALWAYS be used. A "NULL MODEM" or "LAPLINK" cable is required to connect your PC's RS232 serial port to the NX242's RS232 serial port.

Connection from NX242 RS232 9-Pin Serial Port to PC's COM port

NX242 RS232 serial port		PC COM port
1	Unused	1
2 RXD	**←---------Receive---------**	3
3 TXD	**----------Transmit-------→**	2
4	Unused	6
5 SGND	**Signal ground**	5
6	Unused	4
7	Unused	8
8	Unused	7
9	Unused	9

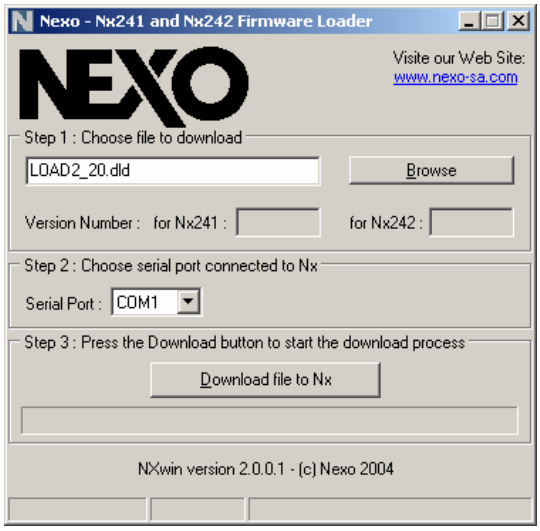
Instructions

The files needed to execute your download will be provided as a *.ZIP file. You will have to extract the contents of this ZIP archive in a temporary directory using third party software such as WINZIP (not provided by NEXO). Once extracted you should have access to the following files:

Two download (.DLD) files: the last official release version and the newly released version. If you experience any problems with the new version, simply reload the old .DLD program to return the unit to the previous version.

- A README.TXT that will contain download instructions
- Manual Update.pdf, which will inform you about all new features of the new LOAD.
- The downloader programs NXWIN.EXE.

Execute the following procedure to load the new software into the NX242 Flash EPROM.



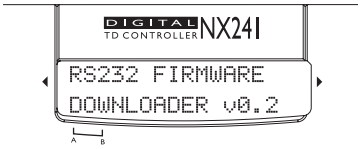
1) Connect the serial cable to the RS232 serial ports on your computer and the NX242. The downloader detects the COM port available on your system. If your system is only equipped with USB ports you will have to use an USB-COM adapter. However you may meet some problems according to the adapter chosen. (there is a lack of specification on the baud rate of the USB converters, leading to an unusual tolerance)

2) Start your Windows OS.

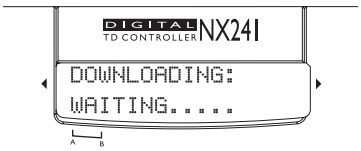
3) Launch the loader.

4) Browse for your .dld file to download, Press "Download file to NX242" button.

5) Now to complete the procedure, you must set the NX242 to "Download" mode to make it ready to accept the program. Power the TDcontroller OFF and then back on (or reset) whilst holding down the MUTE button of channel 1 (leftmost mute). The controller will now enter "Download " mode. First screen displays the revision number of the RS232 Firmware.

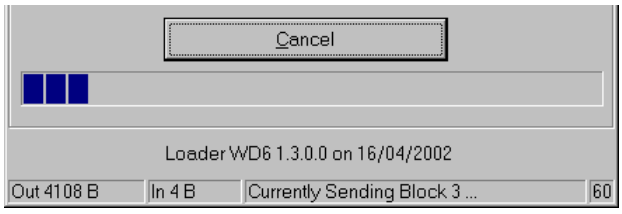


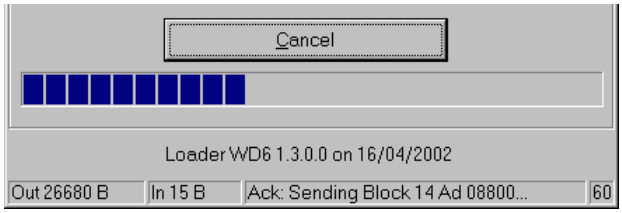
As soon as the message “DOWNLOADING: WAITING” appears, you can press the "OK" button



Have a look to the status bar to follow the downloading process. The Loader sends the first block of code to the NX242. The NX242 acknowledges the reception both on the computer and in the NX242’s LED screen. Downloading continues until the progress bar reaches its leftmost position.

The number in the lower left corner (60) is a timeout. A countdown begins when the transmission is broken (wrong com port, or disconnected…) when it reaches zero an error message is generated.





The download procedure is complete when the unit resets (all LED's on).

6) The NX242 now HAS to be reset AGAIN to enter the configuration menu. Turn the unit OFF, wait 5 seconds and then power back ON or hold down simultaneously the three menu buttons (A, B, ◂ ▸). Hold down the two menu buttons (A, B) to enter the Configuration Menu to choose your cabinet.

The unit is now ready for use.

TECHNICAL SPECIFICATIONS

SPECIFICATIONS	NX242 Digital TDcontroller
Output Level	+28 dBu Max. into 600 Ohms load
Dynamic Range	All Channels = 110dB unweighted
THD + Noise	Typical 0.005% flat setup (Max 0.01%@1000Hz@ 28dBu)
Latency time	2.2ms on a flat setup
Power Supply	115-230 Volts 50-60Hz continuous operation (operating range 90-264V)
FEATURES	
Audio Inputs	Two L&R Heavy Duty Audio inputs, 24bit convertors; Electronically balanced and floating, 20kOhm. CMMR=80dB. Two XLR 3 connectors.
Sense Inputs	4 Amplifier Sense Inputs (LF mono, MF/HF L&R),Floating 150 k . 18 bit converters. 8 Pole Removable Strip Terminal.
Audio Outputs	4 Audio Outputs. 24 bit converters,Electronically balanced, 50 Ohms, 4 XLR-3M connectors
Processing	24 bit data with 48-bit accumulator. 100MIPS,Optional NXtension Expander Board 100MIPS
Front Panel	Menu A and Menu B buttons.16 characters by 2 lines display. Select Wheel & Enter button (◂ ▸). IN Clip – DSP Clip red LED's Speaker Protection yellow LED for each channel. Individual Mute/Solo buttons and red LED for each channel. Amp. Sense & Peak (green & red) LED's for each channel
Rear Panel	On/Off Mains switch; mains IEC socket; RS232 serial communications connector; Expansion slot for processor extension card.
FLASH EPROM	Upgrade for software improvement, new cabinet set-ups available on NEXO web site www.nexo.fr
Dimensions & Weight	1U 19" Rack - 230 mm (9") Depth. 3.8kg (8.8lbs) net
User Controls	
System Selection	Allows control from all NEXO ranges.
System Set-up	Within the selected range, allows the cabinet to be set for passive or active mode, aux,mono or stereo subs, wedge or FOH operations depending on system selected. Up to 80 factory pre-sets.
Protection	Peak Limiter, Displacement and Temperature protection on every channel; Physio control of the Protection limiter & compressors Soft Clip Automatic tracking of amplifier clip point.
Delay	Up to 150m (465 ft.) of delay in 10cm (.4in) steps; on Sub channel, Main channels or Sub + Main linked
Headroom	Allows to adjustment the input sensitivity while keeping an overall unity gain
Output Gain	Global and inter-channel gain 6dB in 0.5dB steps.
Amplifier Gain Reading	Allows amplifier gain checking with program material.
Mute/Solo	Changes front panel buttons from Channel Mute to Solo
Save/Recall	Set-up Stores up to 10 user set-ups; On- the-fly recall, without mute or glitches for instant comparison.
Array EQ	LF or HF shelving filter to compensate ground or stacking effects, +/-6dB, frequency factory tuned.
Security Mode	Password protected in Read-Only Mode.
Certification	CE mark (EN 60065-1998, EN55103-1996), cULus approved (UL60065), FCC part15 compliant, CB scheme

Application Note : Driving the Sub from the AUX send

It is quite common to use the AUX send of a mixing desk to drive the Sub section of a PA system. This gives the mixing engineer more flexibility to set the level of its subbass relative to the main PA, apply special effects, use a different EQ on the Sub…However, it also rises some serious issues for the performance & safety of the system (mostly time alignment).

What is the phase relation between the AUX and MAIN output of your Desk?

At NEXO, when we align systems, we take great care to have an optimum phase alignment from one octave above to one octave below the crossover frequency point. By doing so, we ensure that both drivers are working perfectly together and providing the best efficiency possible. It is then up to the user to adjust the delay on the NX242 to match the physical path difference of the different systems. It is thus possible to get a well adjusted system, even without measuring instruments.

If you choose to drive the Sub from the AUX, you feed the NX242 with two signals coming from different sources. If those two sources (MAIN output & AUX send) are not exactly in phase, you are introducing a delay –without knowing it- into the crossover between your main system and your sub. Without the proper measurement tools, you will never be able to tune the system as it should be.

Why it is unlikely the AUX and MAIN have the same phase?

Signal paths are likely to be different; any filter modifying the bandwidth and EQ of the signal is also affecting the phase.
Example: a 24dB/oct high pass filter set at 15Hz is only affecting amplitude of the signal by 0.6dB at 30Hz but the phase shift is 90°!! At 100Hz we can still measure 25° of phase shift

Should you want to restrict the bandwidth with a low pass filter, you can introduce a phase difference of up to 180° (completely out of phase) at the cross over point

If the signal is passing though any digital equipment you are adding between 1.4ms and 2.2ms (around 70° phase shift at 100Hz) due to the converter delay only! The additional delay due to the processing itself (look ahead compressor, delay…) can be quite important

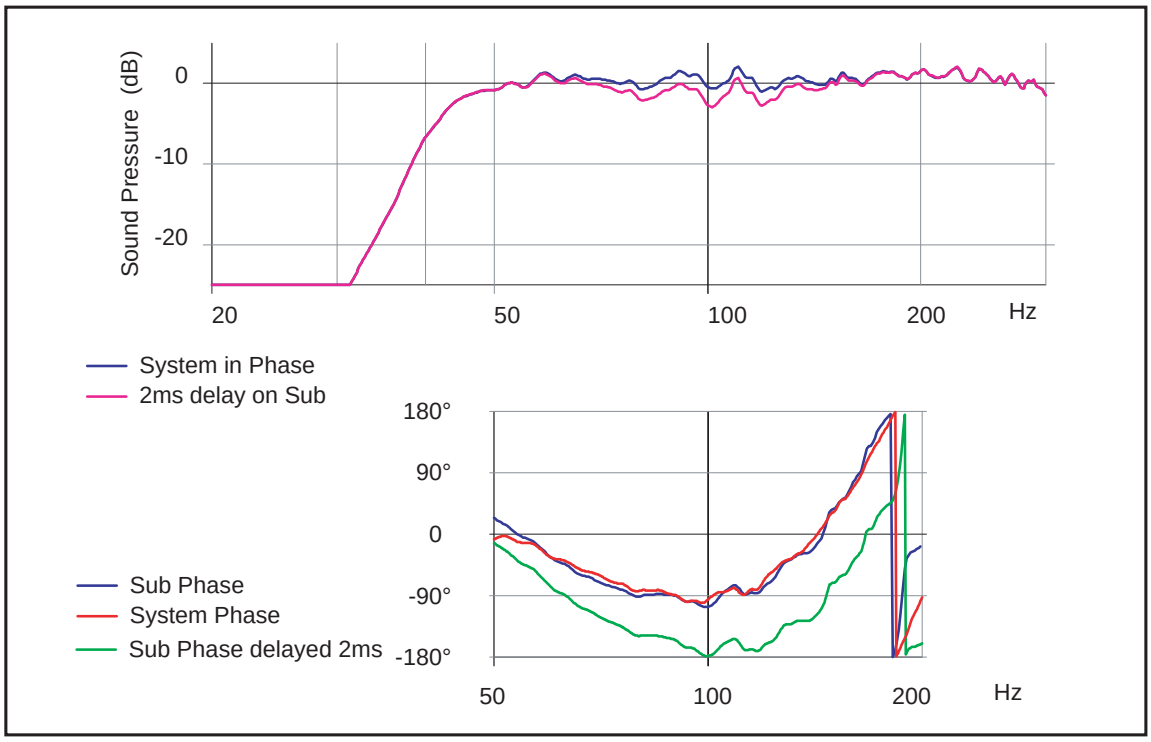
At the end of the day, if you have not measured both outputs in the actual configuration you can be 90% sure that you won't get the correct phase alignment that you would have had if the NX242 was fed by a single source.

Consequences of badly aligned systems

Mis-aligned system have less efficiency: i.e. for the same SPL you will be obliged to drive the system harder, causing displacement & temperature protection at lower SPL than a properly aligned system. The sound quality will decrease. The reliability will decrease as the system is driven harder to achieve the same levels. In certain situations you may even need more speakers to do the same job…

Consider the simple example of the AUX signal passing through a digital device (without processing) that is adding a delay of 2ms due to its conversion time. The AUX is then sent to a CD12 subbass while the MAIN is send to the S850 rig. The first graph display the phase around the crossover point (85Hz in this case)

The two overlapping phases are those of the CD12 and S805 as they should be. The green curve is the same as the blue one with a 2ms delay.



On the magnitude graph display the difference between the well aligned system and the one with the CD12 2ms delayed. The difference is 2dB at 100Hz. This example is displaying the consequences of a slightly incorrect alignment. If we add to this the delay introduced by a slightly different electric path plus the “small” delay introduced by some processing, plus a EQ filter done by the user near the cut off frequency…The graph above could shows differences in excess of 6dB. (Up to the point where the system might work better if you reverse the polarity of the sub !)

Precautions & check

Before using the AUX send of your desk ensure that the output are in phase (you can feed a 100Hz signal at the input and monitor the MAIN and AUX on a dual trace scope)

Always apply EQ or processing to both signals feeding the NX242. So the phase relation is not affected.

Never add additional low pass filtering on the SUB. (or high pass to the main system)

Inverting polarity on one channel should always result in a massive difference near the crossover point. If the sound is more or less the same the system is no longer aligned.

Appendix A : List of Supported presets (LOAD2.22)

At the time of printing, the following factory presets are supported by LOAD 2_22. Please refer to the release notes if the software loaded in your NX242 is not LOAD 2_22.

Keep in mind that you should hold the A & B buttons down when resetting the NX242 to switch from one family of setups to the other.

Setup Name	CH 1	CH 2	CH 3	CH 4
CD18				
CD18 SUPERCARDIO Crossover 75HZ	CD18 # 1 back	CD18 # 1 front	CD18 # 2 back	CD18 # 2 front
CD18 SUPERCARDIO Crossover 100Hz	CD18 # 1 back	CD18 # 1 front	CD18 # 2 back	CD18 # 2 front
CD18 CARDIO Crossover 75HZ	CD18 # 1 back	CD18 # 1 front	CD18 # 2 back	CD18 # 2 front
CD18 CARDIO Crossover 100Hz	CD18 # 1 back	CD18 # 1 front	CD18 # 2 back	CD18 # 2 front
CD12				
2xCD12 Flown STEREO(1-2)(3-4)	CD12 # 1 back	CD12 # 1 front	CD12 # 2 back	CD12 # 2 front
2xCD12 Ground STEREO(1-2)(3-4)	CD12 # 1 back	CD12 # 1 front	CD12 # 2 back	CD12 # 2 front
S2				
4 S2 cabinets S2-63 Hz	S2 # 1	S2 # 2	S2 # 3	S2 # 4
4 S2 cabinets S2-80 Hz	S2 # 1	S2 # 2	S2 # 3	S2 # 4
AlphaE stereo				
AlphaE Stereo AEM + B1-18	B1-18 Left	B1-18 Right	AEM Left	AEM Right
AlphaE Stereo X AEM + B1-18xover	B1-18 Left	B1-18 Right	AEM Left	AEM Right
AlphaE Mono				
ALPHAE Mono AEM B1-18 S2-63	S2	B1-18	AEM	-
ALPHAE Mono AEM B1-18 S2-80	S2	B1-18	AEM	-
AlphaE Active				
ALPHAE ACTIVE 3W B1-18 MF HF	-	B1-18	AEM-MF	AEM-HF
ALPHAE ACTIVE 4W S2 B1-18 MF HF	S2	B1-18	AEM-MF	AEM-HF
Alpha				
ALPHATD B1+M3 No SubTD	-	B1-15	A-MF	A-HF
ALPHATD S2+B1+M3 SubTD S2-63 Hz	S2	B1-15	A-MF	A-HF
ALPHATD S2+B1+M3 SubTD S2-80 Hz	S2	B1-15	A-MF	A-HF

ALPHATD +B1+M3 Xover for CD18	-	B1-15	A-MF	A-HF
ALPHATD B1+B1+M3 B1 on ch 1 and 2	B1-15	B1-15	A-MF	A-HF
PS8				
PS8TD Wideband NO SUB	-	-	PS8 left	PS8 right
PS8TD crossover With LS400	Same as ch 2	LS400	PS8 left	PS8 right
PS10				
PS10TD Wideband NO SUB	-	-	PS10 left	PS10 right
PS10TD Crossover With LS500	Same as ch 2	LS500	PS10 left	PS10 right
PS15				
PS15TD Overlap With LS1200	Same as ch 2	LS1200	PS15 left	PS15 right
PS15TD Crossover With LS1200	Same as ch 2	LS1200	PS15 left	PS15 right
PS15TD Crossover With S2	Same as ch 2	S2	PS15 left	PS15 right
PS15 active				
PS15TD ActiveXOV LF(1-2) HF(3-4)	LF Left	LF right	HF Left	HF right
PS15TD Active LF(1-2) HF(3-4)	LF Left	LF right	HF Left	HF right
PS15TD ActiveXOV S2(2)LF(3) HF(4)	-	S2	LF	HF
GeoS 805 + CD12				
S805 4-8 boxes No Sub	-	-	S805 left	S805 right
S805 9-16 boxes No Sub	-	-	S805 left	S805 right
S805 4-8 boxes Stereo FLW Xover	-	-	S805 left	S805 right
S805 9-16 boxes Stereo FLW Xover	-	-	S805 left	S805 right
S805 4-8 boxes Stereo Grd Xover	-	-	S805 left	S805 right
S805 9-16 boxes Stereo Grd Xover	-	-	S805 left	S805 right
S805 4-8 boxes Mono CD12 Flown	CD12 back	CD12 front	S805	- Same as ch 3
S805 9-16 boxes Mono CD12 Flown	CD12 back	CD12 front	S805	Same as ch 3
S805 4-8 boxes Mono CD12 Ground	CD12 back	CD12 front	S805	Same as ch 3
S805 9-16 boxes Mono CD12 Ground	CD12 back	CD12 front	S805	Same as ch 3

GeoS 805 + CD18				
S805 4-8 boxes Mono CD18 Ground	CD18 back	CD18 front	S805	Same as ch 3
S805 9-16 boxes Mono CD18 Ground	CD18 back	CD18 front	S805	Same as ch 3
GeoS 830 + CD12				
S830 horizontal wideband stereo	-	-	S830 left	S830 right
S830 horizontal with CD12 Flown	CD12 back	CD12 front	S830	Same as ch 3
S830 horizontal with CD12 Ground	CD12 back	CD12 front	S830	Same as ch 3
GeoS 830 + CD18				
S830 horizontal Mono CD18 Ground	CD18 back	CD18 front	S830	Same as ch 3
GeoT 4805				
GeoT 4805-2815 Crossover 75Hz	Back speaker	Front speaker	HF	-
GeoT 4805-2815 Crossover 100HZ	Back speaker	Front speaker	HF	-